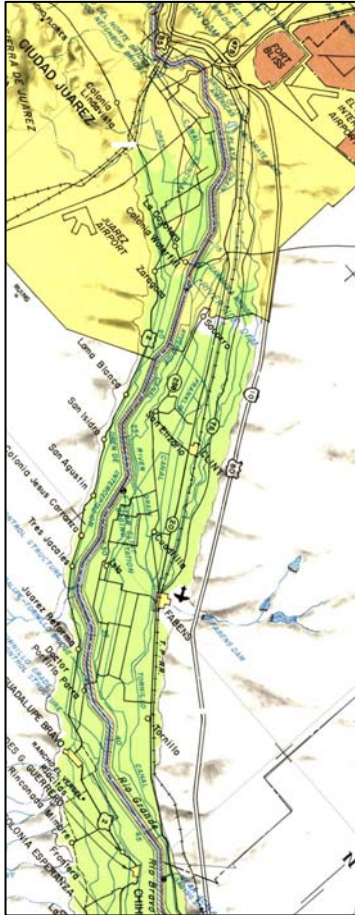


ALTERNATIVES REPORT

Programmatic Environmental Impact Statement Rio Grande and Tijuana River Flood Control Projects



United States Section
International Boundary and
Water Commission
El Paso, Texas



January 2007



PARSONS
Austin, Texas

ALTERNATIVES REPORT

PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

RIO GRANDE AND TIJUANA RIVER FLOOD CONTROL PROJECTS

Prepared for

UNITED STATES SECTION
INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

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USIBWC CONTRACT IBM04D0002, TASK ORDER IBM05T0022

FEBRUARY 2007

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SECTION 1 INTRODUCTION

1.1 BACKGROUND

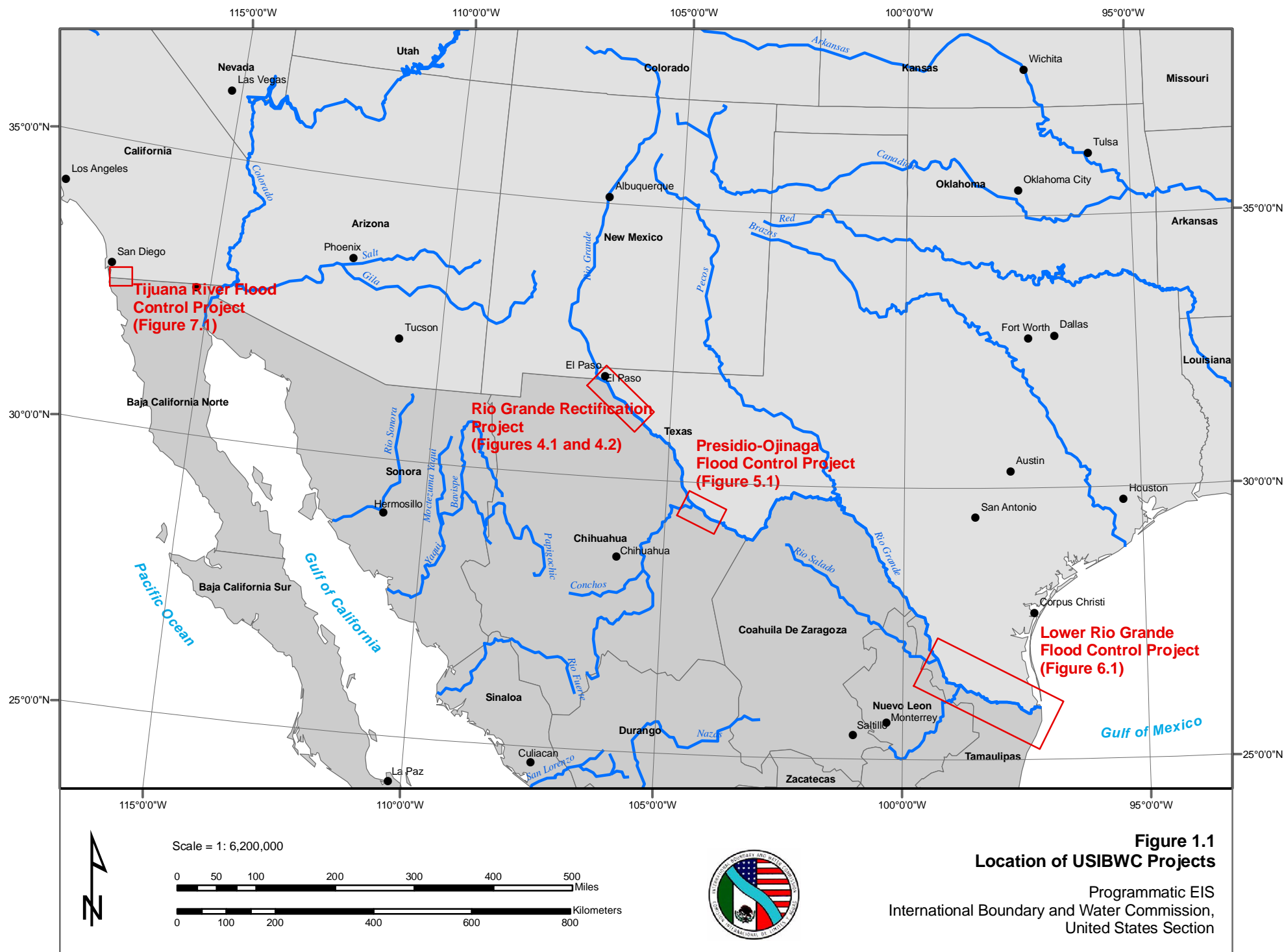
The United States Section, International Boundary and Water Commission (USIBWC) is preparing a Programmatic Environmental Impact Statement (PEIS) to evaluate potential impacts of a range of maintenance activities and future improvements to four of its flood control projects. The objective of the PEIS is to evaluate maintenance alternatives and project improvements that would allow USIBWC to minimize potential environmental impacts and take advantage of environmental and recreational opportunities while meeting its mandate for flood protection, boundary stabilization, and water delivery. Those projects, whose locations are illustrated in Figure 1.1, are:

- Rio Grande Rectification Project extending 84.4 miles along the Rio Grande, downstream from American Diversion Dam to Fort Quitman, Texas.
- Presidio-Ojinaga Flood Control Project extending over 13.1 river miles of the Rio Grande near Presidio, Texas.
- Lower Rio Grande Flood Control Project extending 186 river miles on the Rio Grande, from Peñitas, Texas to the Gulf of Mexico, and including 120 miles of interior floodway.
- Tijuana River Flood Control Project in southern California, containing 2.3 miles of levees starting at the international boundary.

In general terms, USIBWC maintains the river channel, floodways, levees, and other structures in the projects; controlling vegetation in the floodways and levees; removing sediment and debris from the channel, floodways, and mouths of arroyos; and grading and stabilizing floodways and levees.

Flood control projects located along the United States portion of the Rio Grande provide boundary stabilization and water delivery in addition to providing flood control to urban, suburban, and agricultural lands. The Tijuana River Flood Control Project in southern California was built only for flood control purposes and does not have the functions of boundary stabilization and water delivery.

This report identifies alternatives developed for maintenance and improvements to the four flood control projects whose potential impacts will be evaluated in the PEIS.



1.2 REPORT ORGANIZATION

This report presents the following information:

Section 1: Provides background information on the PEIS objectives.

Section 2: Presents the process followed to formulate the alternatives and an overview of alternatives and actions by control project for evaluation in the PEIS.

Section 3: Describes current maintenance activities and alternatives for improvements in operation and management, water use and conservation, and multipurpose use of the Rio Grande Rectification Project (Rectification Project).

Section 4: Describes current maintenance activities and alternatives for improvements in operation and management, water use and conservation, and multipurpose use of the Presidio-Ojinaga Flood Control Project (Presidio Project).

Section 5: Describes current maintenance activities and alternatives for improvements in operation and management, water use and conservation, and multipurpose use of the Lower Rio Grande Flood Control Project (LRGFCP).

Section 6: Describes current maintenance activities and alternatives for improvements in operation and management and additional uses of the Tijuana River Flood Control Project (Tijuana River Project).

SECTION 2 FORMULATION OF ALTERNATIVES

2.1 INITIAL IDENTIFICATION OF POTENTIAL MEASURES AND ALTERNATIVES

2.1.1 Public Scoping

Potential actions and alternatives identified for each flood control project were initially identified by the Engineering, Operations and Environmental Divisions of the USIBWC. A summary description of those actions and alternatives was provided for comment to agencies, state and local governments, organizations, and other potential stakeholders as part of a public scoping process. Five public scoping meetings were held in the Cities of El Paso, Presidio, and McAllen, Texas (January 11, 13 and 19, 2005, respectively); Las Cruces, New Mexico (January 12, 2005); and Imperial Beach, California (January 27, 2005). Findings and conclusions of this process were compiled by the USIBWC in the 2005 document *Scoping Meeting Summary, Programmatic Environmental Impact Statement, Rio Grande and Tijuana River Flood Control Projects*. Comments and recommendations submitted during the scoping process were then incorporated into a revised set of preliminary alternatives for evaluation in the PEIS. The scoping process included a fifth flood control project, the Rio Grande Canalization Project, no longer included in the PEIS evaluation.

2.1.2 Measure Organization by Project Objective

Measures initially identified during development of the PEIS and scoping meetings were consolidated to reflect four major objectives of the flood control projects:

- Ongoing and future activities associated with the *flood control mission* of all projects, namely those associated with maintenance and improvements to the levee system and floodways.
- Ongoing and future activities specifically associated with the *water deliveries and boundary preservation mission*, in accordance with regional and international obligations. Those activities are primarily associated with channel maintenance and sediment removal and management, and apply to the three Rio Grande flood control projects.
- Activities associated with *management of water resources* such as water quality, use and conservation. While this is not a goal inherently associated with the flood control and water delivery project mission, it reflects strategic goals adopted by the USIBWC as an integral part of improved project functionality and cooperation with local initiatives.

- Activities associated with *potential multipurpose use* of the projects, such as additional floodway utilization for purposes other than optimization of flood control, as well as regional environmental initiatives outside the USIBWC jurisdiction. These initiatives would be implemented and managed by other agencies or organizations, and supported through cooperative agreements.

2.2 BASIS FOR ALTERNATIVES FORMULATION

Feasible and likely beneficial measures were identified on the basis of opportunities and constraints for inclusion in the evaluation of potential impacts. The resulting analysis excluded from evaluation those actions that are in conflict with the project objectives, or small-scale measures with minimum potential impacts or environmental benefit. A summary of key considerations for each individual project is presented in Table 2.1 and briefly discussed below.

Table 2.1 Opportunities and Constraints for Project Improvement

Opportunities and Constraints	Rio Grande Rectification	Presidio-Ojinaga	Lower Rio Grande (LRGFCP)		Tijuana River
			River Segment	Interior Floodways	
Flood control objective	Yes	Yes	Yes	Yes	Yes
Primary control of floodway management	USIBWC	USIBWC	Federal and state natural agencies / Private / NGOs	USIBWC for use as flood easements	USIBWC
Water delivery and boundary stabilization	Yes	Yes	Yes	No	No
Dry-weather baseflow	Minimum, largely used upstream	Low flow, seasonally variable	Continuous, seasonally variable	Agricultural and municipal return flows	None
Scale	86 miles	13 miles	186 miles	120 miles	2.3 miles
Vegetation and wildlife habitat	Relatively diversified	Relatively diversified	Very diversified	Low diversification	Minimum diversification
Environmental issues	Limited and mostly known issues	Few and mostly known issues	Complex issues partially addressed	Few and mostly known issues	Few issues associated with the flood control function
Ongoing environmental initiatives for floodway use	Few	Few	Multiple by agencies and organizations	Small-scale only	Few
Potential for additional multipurpose use	Moderate	Very limited	Moderate	Very limited	Minimum

2.2.1 Flood Control

Flood control is a common element to all projects. The need for improved flood control have been identified for LRGFCP, Rectification Project, and Presidio Project. For the

LRGFCP, levee improvements are needed, both for the river levee system and interior floodways. Implementation of improvements is underway for upstream reach of the levee system, and others are scheduled for implementation in the downstream reach over the next 3 years. Evaluations of potential levee deficiencies have been completed for the Rectification and Presidio projects. No levee deficiencies have been identified for the Tijuana River Project.

Floodway management is a key component of flood control that restricts extensive vegetation development. Floodways in the Rio Grande Rectification and Presidio Projects are almost entirely under USIBWC management control, providing opportunities for implementation of environmental improvements. Along the LRGFCP reach along the Rio Grande, however, USIBWC jurisdiction is primarily limited to narrow corridors along the streambank and flood control levees; most of the floodway is under private ownership for agricultural use or natural resources management agencies and organizations. Management of the LRGFCP interior floodways, largely used for agriculture, is controlled by the USIBWC as flood easements.

2.2.2 Water Delivery and Boundary Preservation

Water Delivery for irrigation and boundary stabilization are primary functions of the Rectification, Presidio, and river reach of the LRGFCP. These functions are not applicable to the interior floodways of the LRGFCP or the Tijuana River Project.

Rio Grande baseflow conditions during dry weather are largely controlled by water delivery allocations regulated by upstream diversion dams. The USIBWC maintains the river channel and floodways, but does not have control over the timing or extent of irrigation releases.

Rectification Project baseflow below the American diversion dam is minimal throughout the year because flow is largely diverted upstream of the project. A dry stream bed is predominant throughout most of the Rectification Project. The Presidio Project also has low upstream flow contributions, but the baseline flow becomes more stable downstream from a major Mexico tributary stream, the Rio Conchos. Flows reaching the LRGFCP are mainly controlled by operation of the bi-national Falcon Dam and subsequent return irrigation flows. Baseflow decreases along the project as irrigation water is withdrawn for agriculture. The downstream end of the LRGFCP, below Brownsville, has a minimum baseflow that often causes water ponding and, in recent years, temporary closure of the river mouth into the Gulf of Mexico.

2.2.3 Project Scale and Diversity

Project length and floodway size, as well as topographic diversification, restrict the extent of additional flood control actions or environmental initiatives. The Rectification Project is of a relatively large scale, and topographic and habitat diversification. A steep terrain is predominant in the downstream reach of the project, resulting in a very narrow floodway. The Presidio Project also has a predominantly steep topography and a narrow floodway; its short

extent and limited floodway provide a low potential for additional flood control or implementation of environmental initiatives. The river segment of the LRGFCP is extensive and is surrounded by a diversified floodway of multi-purpose use; the land located riverside of the levee system is mostly outside USIBWC jurisdiction. Use of the LRGFCP interior floodways is strictly limited to pasture and seasonal agriculture that precludes development of any wooded vegetation or uncontrolled vegetation growth. In the Tijuana River Project, support of environmental initiatives is severely restricted by flood control requirements and small extent of the floodway.

2.2.4 Environmental Initiatives and Cooperative Agreements

Rectification Project

Both flood control needs and Border Patrol operations are primary restrictions to significant vegetation development and implementation of other environmental initiatives along the Rectification Project. Replacement of non-native wooded vegetation with vegetation that has lower water consumption is the most significant and viable regional initiative identified.

During the scoping meetings, focusing on the Rio Bosque Wetlands, located outside the floodway, was proposed as the most effective measure for habitat enhancement because flow in the Rectification Project flows is heavily regulated by upstream control. Other proposed actions for recommended for evaluation included salt cedar management and control, reduced sediment removal, increased sediment control in tributary arroyos, and disposal of dredged channel material outside the floodway.

Presidio Project

Both flood control needs and Border Patrol operations are primary restrictions to significant vegetation development and implementation of other environmental initiatives along the Presidio Project. During the scoping meetings, proposed actions for recommended for evaluation included replacement of non-native wooded vegetation with low-water consumption plant species to be implemented as a regional initiative given the extensive salt cedar infestation upstream of the Presidio Project.

Lower Rio Grande Flood Control Project

Most of the LRGFCP floodplain along the Rio Grande is under private ownership for use in agriculture or, increasingly over the last 20 years, has been acquired by various agencies and organizations for management of natural resources. In the lower 65-mile reach of the LRGFCP, recent regulatory decisions by the USFWS and other agencies have defined the extent of vegetation management, largely restricting potential changes. For the most part, USIBWC participation in environmental initiatives has focused on supporting regional environmental initiatives having flood control or water delivery as a significant component. Along the LRGFCP interior floodways, a few environmental initiatives have been identified, such as replacement exotic grass species with native species or limited participation in small-scale wetlands development projects.

The LRGFCP has a steady water flow along most of the stream channel, but its lower reach along the Rio Grande suffers from periodic infestations of water hyacinth and hydrilla that choke the channel. During the PEIS scoping meetings, increased control of these invasive species was recommended. Increased participation of the USIBWC in current and future efforts by other agencies, local governments, and organizations to increased use of the Lower Rio Grande Valley as an eco-tourism destination was suggested to improve the local economy and promote habitat enhancement and recreational opportunities.

Tijuana Project

The specific flood control purpose of the Tijuana Project and its small geographic scale severely limits a significant use of the small floodway for environmental improvement initiatives. The Tijuana Project is located upstream from a valuable protected natural area, the Tijuana River National Estuarine Research Reserve and Tijuana Slough National Wildlife Refuge, providing opportunities for limited USIBWC support of regional environmental initiatives.

2.3 FORMULATION OF ALTERNATIVES

2.3.1 Definition of Alternatives by Project Objective

Measures initially identified during development of the PEIS and scoping meetings were consolidated to reflect four major project objectives previously discussed:

- Ongoing and future activities associated with the *flood control mission* of all projects;
- Ongoing and future activities specifically associated with the *water deliveries and boundary preservation mission*;
- Activities associated with *management of water resources* such as water quality, use and conservation; and
- Activities associated with potential *multipurpose use of the projects*, implemented and managed by other agencies or organizations, and supported through cooperative agreements.

Those project objectives were used as a guideline for formulation of a No Action Alternative and three action alternatives as described below. Table 2.1 illustrates differences of each alternative relative to the No Action Alternative.

No Action Alternative, the continuation of current O&M practices, including actions planned or identified for short-term implementation.

Enhanced Operation and Maintenance Alternative (EOM Alternative) addressing anticipated or likely improvements in flood control and water delivery beyond those to be implemented under current O&M practices;

Integrated Water Resources Management Alternative (IWR Alternative) that includes future actions intended to improve water quality, water use and water conservation, in addition to those changes in flood control and water delivery identified under the EOM Alternative;

Multipurpose Project Management Alternative (MPM Alternative) which adds the multi-purpose use of the floodway and environmental initiatives to improvements measures already under consideration under the EOM and IWR Alternatives.

Table 2.1 Measure Organization by Categories used in the Formulation of Alternatives

Measure Category	Enhanced Operation & Maintenance (EOM)	Integrated Water Resources Management (IWR)	Multipurpose Project Management (MPM)
<i>IMPROVED FLOOD CONTROL AND WATER DELIVERY</i>			
Modifications to levee system	X	X	X
Potential for modified floodway management	X	X	X
Modified channel maintenance	X	X	X
<i>WATER RESOURCES MANAGEMENT</i>			
Improved water use and conservation		X	X
Water quality improvement		X	X
<i>MULTIPURPOSE PROJECT MANAGEMENT</i>			
Additional use of jurisdictional floodway			X
Cooperative agreements and regional initiatives			X

2.3.2 Mitigation and Compensation Measures

In addition to measures previously identified as components of the alternatives, a number of measures have been implemented as mitigation in past projects, either directly by the USIBWC, or developed in cooperation with regulatory agencies and other organizations. Mitigation measures are not a component of the alternatives and are applicable to any given project or alternative. Mitigation and compensation measures currently implemented or of potential future use include:

- Compensation for extent or quality of impacted wetlands;
- Revegetation in floodways or construction areas;
- Monitoring and improvement of water quality;

- Site-specific surveys of biological and cultural resources;
- Modified timing or extent of construction or maintenance activities;
- Development or improvement of wildlife habitat corridors;
- Use of in-stream structures to diversify aquatic habitat;
- Off-channel modifications for aquatic habitat development;
- Wildlife habitat improvements outside the jurisdictional ROW such as conservation easements.

SECTION 3 RIO GRANDE RECTIFICATION PROJECT

3.1 DESCRIPTION

The Rio Grande Rectification Project, constructed between 1934 and 1938, extends 86 river miles from El Paso to Fort Quitman, Texas. The purpose of the project is to stabilize the international river boundary and to provide flood protection for both countries in urban, suburban, and agricultural areas. Figures 3.1 and 3.2 show the project location and main geographic features and structures along the upper and lower reaches of the Rectification Project, respectively.

3.1.1 Components

The Rectification Project was constructed by strengthening the river channel and developing a narrow floodway by constructing levees on both sides of the river. The channel strengthening process removed several meanders and resulted in a reduction in the river length from 155 to 86 miles. Four grade control structures were also installed: Island, Tornillo, Alamo, and Guayuco. The average channel depth along the Rectification Project is 3 to 5 feet. The width of the channel is between 66 and 100 feet and its capacity is 1,000 cfs. The floodway width averages about 590 feet and its capacity is 11,000 cfs. The project includes 85.4 miles of levees on the U.S. side, and 83.7 miles of levees on the Mexico side. The average levee height is 7.2 feet, the average top width is 20 feet.

3.1.2 Water Resources

The Rectification Project runs along water quality management Segments 2307 and 2308 of the Rio Grande, as defined by the Texas Commission on Environmental Quality.

Segment 2308 extends from the International Dam to the Riverside Diversion Dam. Flows in Segment 2308 are limited by water diversions upstream at the American and International dams. The designated uses of this segment include limited aquatic life, and non-contact recreation. These designated uses were fully supported according to the 2003 Regional Assessment of Water Quality in the Rio Grande Basin.

Segment 2307 flows 220 river miles from the Riverside Diversion Dam to the confluence with the Rio Conchos, near Presidio, Texas. Flows in Segment 2307 are also minimal and are composed primarily of agricultural and municipal return flows. Designated uses in this segment include contact recreation, public water supply, high aquatic life use, and fish consumption. Water quality information in the Rectification Project portion of the segment indicates that surface water quality standards are exceeded for chloride and fecal coliform. In addition, ammonia levels are above screening limits, which may be the result of either point or non-point pollution.

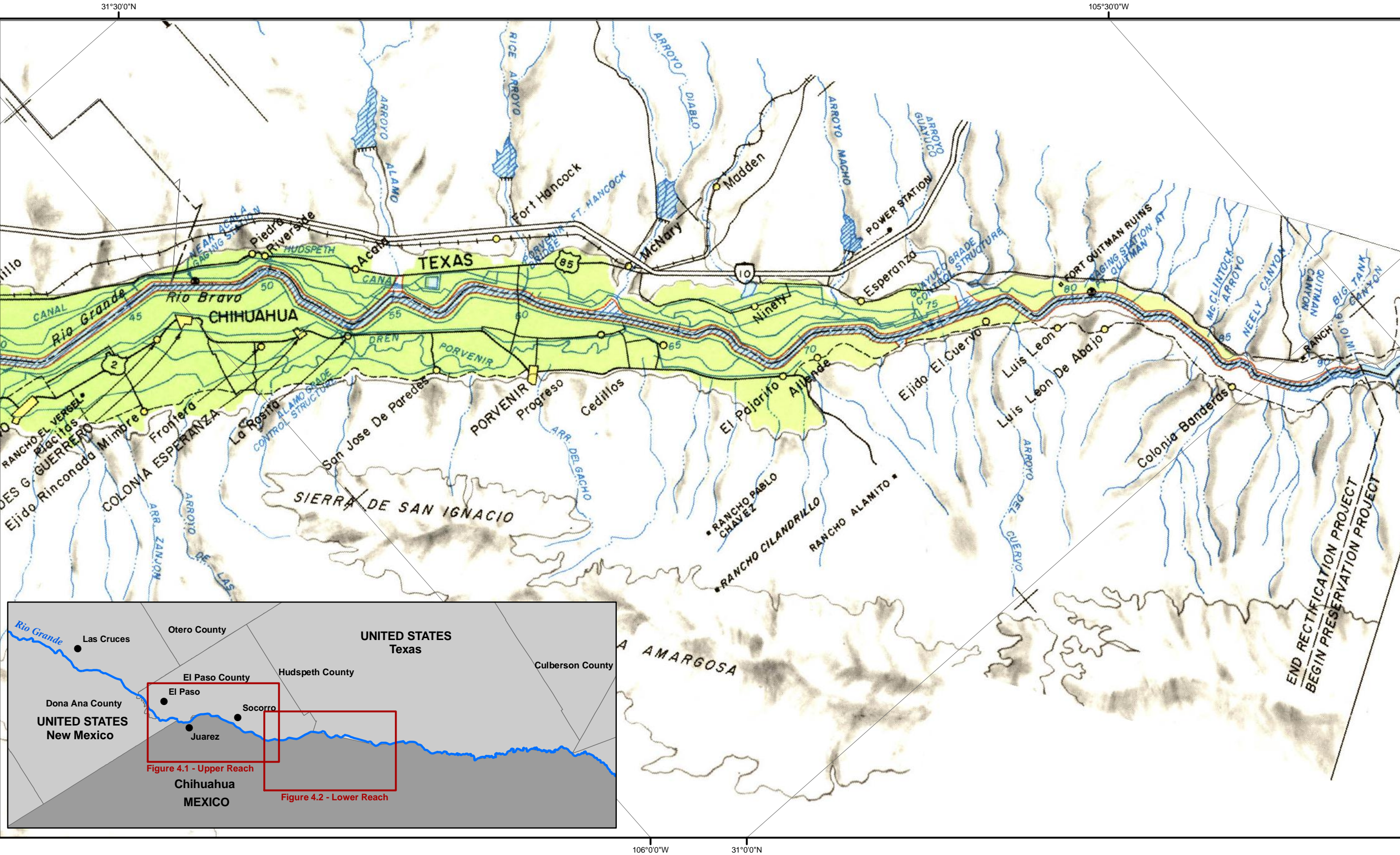
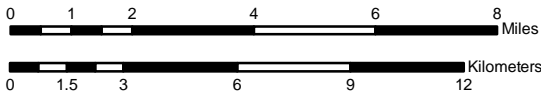


Figure 3.2
Rio Grande Rectification Project - Lower Reach
 Programmatic EIS
 International Boundary and Water Commission,
 United States Section



Scale = 1: 200,000



LEGEND

- | | |
|---|--|
|  Irrigated Areas |  Urban Areas |
|  Floodway |  Military Reservation |

3.1.3 Environmental Improvements and Initiatives

Currently, there are no recreational areas in the floodplain of the Rectification Project. A trail system is under development by the City of El Paso (Rio Grande River Trail and Park) to be operated by the University of Texas at El Paso's Center for Environmental Resource Management. The trail will be located within the U.S. floodplain beginning at Fonseca Drive and extending 4.9 miles to Yarbrough Drive. Outside its ROW, the USIBWC facilitated construction of the Rio Bosque Wetlands Park, a multi-agency project that includes approximately 30 acres of wetlands. Wetlands were constructed as mitigation for a previous USIBWC project, as required in a 1993 Coordination Report by the U.S. Fish and Wildlife Service. Wetlands are supported with effluent from the City of El Paso Bustamante Wastewater Treatment Plant.

3.2 CURRENT MAINTENANCE PRACTICES

3.2.1 Levee System

The USIBWC conducts the following activities for maintenance of the Rectification Project levee system, either routinely or on an as-needed basis:

- Grade and resurface maintenance road on levees
- Mow/cut brush/woody vegetation from levee slopes; repair erosion-related damage
- Maintain grass vegetation

Maintenance of levees includes road maintenance, mowing of slopes, and erosion repairs. Maintenance supervisors drive the length of the U.S. levees each week to check condition, and repairs are conducted as needed. Resurfacing of levee roads, using gravel, takes place in a 20-year cycle that requires annual improvements at selected locations. Slopes are mowed continually with farm tractors and rotary slope mowers. Approximately 100 river miles of levee slope are mowed annually. Bank stabilization is performed as need or after high flow events, about four to five of which occur per year. Typically after a high flow event, five to six locations are stabilized.

3.2.2 Floodways

The USIBWC conducts the following activities for maintenance of floodways of the Rectification Project, either routinely or on an as-needed basis:

- Mow floodway to control weeds and woody vegetation
- Remove debris in floodway on regular basis
- Perform floodway smoothing to reduce flow resistance

Floodways are leveled annually in areas that need it. Mowing takes place at least twice per year prior to July 15th to remove vegetation and other obstructions from the floodway. Mowing

is performed along the entire U.S. floodway with farm tractors using rotary slope mowers. The USIBWC also does special vegetation clearing at the request of the U.S. Border Patrol (USBP). Mowing is not conducted during certain seasons in an area of floodway claimed by the Tiguas, to allow the use of the river for ceremonial purposes, and during Borrowing Owl nesting season. Mowing in this area is conducted at other times of the year. New lighting has recently been installed by the USBP in the floodway from the American Dam to the Zaragoza bridge.

3.2.3 River Channel

The USIBWC conducts the following activities for maintenance of the Rectification Project river channel, either routinely or on an as-needed basis:

- Remove sediment from channel to maintain conveyance capacity and diversion requirements.
- Stabilize banks using riprap revetment and other structural channel linings.
- Perform structural repairs and modifications to dams, bridges, and other structures on an as-needed basis .
- Excavate arroyo mouths to maintain channel grade and conveyance.
- Adjust gates to maintain pool elevation; divert flows and flush sediment and debris
- Maintain grade control structures (Island, Tornillo, Alamo and Guayuco grade control structures).

Riprap revetment is used to stabilize stream banks and to repair scour protection of channel invert at utility crossings. Arroyo mouths as well as the main channel are excavated to maintain channel grade and conveyance and ensure irrigation deliveries. Sediment removal is done on an as-needed-basis. Sediment is deposited at designated locations in the floodway, uplands, federal and private land, as per existing agreements.

3.3 ENHANCED O&M (EOM)

Possible or likely actions for enhanced O&M of the Rectification Project in terms of flood control improvements and changes in water delivery are discussed below and summarized in Table 4.1.

Table 4.1 Potential Improvements to Flood Control and Water Delivery in the Rectification Project

RECTIFICATION PROJECT	ALTERNATIVE*			Anticipated Change Relative to the No Action Alternative
	EOM	IWR	MPM	
FLOOD CONTROL AND WATER DELIVERY				
Levee Improvements				
Levee height increase	X	X	X	Improvement projects required based on hydraulic modeling; most of the improvements are required in the lower reach
Structural levee improvements	X	X	X	Changes partially required to implement USACE 2004 recommendations
Relocation within ROW or new flood easements				Changes not anticipated or considered a desirable/viable option for implementation
Changes in Floodway Management				
Streambank stabilization with vegetation in combination with mechanical means				No significant changes. Small localized projects are possible but not anticipated at a large scale
Vegetation removal and timing/extent of mowing	X	X	X	Changes possible in extent or timing, within current seasonal restrictions
Agricultural/grazing use				Use of agricultural/grazing leases for floodway management has been discontinued
Changes in Channel Maintenance				
Sediment removal and disposal	X	X	X	Changes possible in extent or disposal location (outside floodway under commercial agreements)
Debris removal				No changes anticipated; to be continued on an as needed basis
Shore/aquatic vegetation removal				No changes relative to current as-needed basis
New/changes to diversion structures				Future construction of structures is not anticipated as an USIBWC initiative
*EOM: Enhanced O&M; IWR: Integrated Water Resources Management; MPM: Multipurpose Project Management				

Improvements to the levee system will entail an increase in height as indicated by the 2003 hydraulic modeling results to meet current flood control criteria. Limited improvements are needed in the upper 45-mile reach of the project (at approximately river miles 0-2 and 15-17); more extensive improvements have been identified for the lower reach of the project (at approximately river miles 48-52, 59-62, 65-76 and 80-91). Limited structural improvements are also anticipated based on a 2004 study by USACE. Levee relocation along the Rectification Project is not anticipated nor considered a desirable or viable option for implementation by the USIBWC.

Changes in *floodway management* are possible in terms of timing/extent of mowing and wooded vegetation control. Changes would require compatibility with current seasonal restrictions at some project segments due to ceremonial practices by the Tiguas and nesting season of the Burrowing Owl. Greater restrictions on public use/access to the floodway are expected as a result of increased USBP operations (restricted use zones). Small localized projects of streambank stabilization by bioengineered techniques are possible but not anticipated on a large scale. Leases for agricultural use are not anticipated, and the policy of eliminating grazing leases will be continued (non renewal of existing leases).

Changes in *river channel maintenance* would cover primarily sediment disposal outside the floodway through commercial agreements. Timing of sediment flushing from the International Dam could be modified. No changes are expected in the timing or extent of activities for removal of debris and shore/aquatic vegetation, currently conducted on an as-needed basis. Changes to water diversion dams or structures, or new construction, are not planned as USIBWC initiatives.

3.4 INTEGRATED WATER RESOURCES MANAGEMENT (IWR)

In addition to those previously discussed for the EOM Alternative, likely future actions for improvements to water resources management, summarized in Table 4.2, are discussed below.

Table 4.2 Potential Improvements to Water Resources Management in the Rectification Project

RECTIFICATION PROJECT	ALTERNATIVE*			Anticipated Change Relative to the No Action Alternative
	EOM	IWR	MPM	
FLOOD CONTROL AND WATER DELIVERY				
Levee improvements and changes in floodway and channel maintenance	X	X	X	IWR Alternative includes all measures identified as feasible for the EOM Alternative
INTEGRATED WATER RESOURCES MANAGEMENT				
Water Use and Conservation				
Salt cedar management		X	X	Changes possible to develop and implement salt cedar management along the channel and arroyos
Revegetation with low-water use species				Measure not expected given the very limited vegetation present in the floodway.
Wetlands improvement				There are no plans for wetlands development
Support maintenance of irrigation structures and drains				No changes anticipated to ongoing cooperation with irrigation districts
Water Quality				
Water quality monitoring				No changes anticipated to ongoing participation in state monitoring programs
Modified irrigation drain maintenance		X	X	Possible cooperation plans with irrigation districts to improve return flow quality
Limited floodway revegetation to reduce erosion and sediment load to the river				Implementation not anticipated given the small floodway contribution to watershed sediment load generation
*EOM: Enhanced O&M; IWR: Integrated Water Resources Management; MPM: Multipurpose Project Management				

Main improvements to *water use and conservation* are to develop and implement salt cedar management along the channel and at arroyo mouths, a regional priority, as well as revegetation with low-water use species. Another possible improvement is to increase water supply to Rio Bosque Wetlands during the growing season, a measure currently under consideration as a non-USIBWC project. Implementation of irrigation best management practices to increase water delivery efficiency and reduce water losses would be conducted in cooperation with El Paso No. 1 Water Conservation District and Hudspeth County Irrigation District.

Water quality improvements include continued monitoring to address high chloride and fecal coliform concerns, as well measures to improve water quality in coordination with the two irrigation districts. Those measures include modified irrigation drain maintenance, return flow treatment methods, and maintenance of irrigation structures. Limited floodway revegetation, using grasses, could be implemented in the future to reduce erosion and sediment load in the river.

3.5 MULTIPURPOSE PROJECT MANAGEMENT (MPM)

In addition to those previously discussed for the IWR Alternative, possible actions for multipurpose use of the Rectification Project are discussed below. Those actions are summarized in Table 4.3.

Two potential actions are likely to be implemented in the Rectification Project for *multipurpose use of the jurisdictional floodway*. First, development of plans for parks, nature trails, and recreational areas proposed by local authorities and/or natural resources management agencies or organizations. These plans will likely be limited to the El Paso vicinity given the increased access restrictions by USBP operations. The second action is the control invasive/exotic species, particularly programs for salt cedar removal, as endorsed by agencies, farming community, and local authorities.

Additional habitat conservation areas and riparian corridors are possible in some relatively undeveloped areas in the lower reach of the Rectification Project; those actions appear feasible only on a small scale due to conflicts with flood control requirements and/or compatibility with USBP operations. Third-party floodway maintenance is not under consideration.

Cooperative Agreements and Environmental Initiatives would extend beyond USIBWC jurisdiction. Those initiatives, to be implemented and managed by other agencies or organizations and supported by the USIBWC under cooperative agreements, may include:

- Participation in salt cedar removal initiatives identified as a regional priority. This action would be conducted in coordination with the Mexican Government as previously implemented by the U.S. Forest Service at the Big Bend National Park.
- Participation in wildlife habitat conservation initiatives identified as regional priorities, including expansion of backwaters at the mouth of arroyos to increase aquatic habitat as an initiative that requires support from both natural resources management organizations and irrigation districts.
- Flow regime modification to provide year-round baseflow. Viable only as a regional, multi-agency initiative; USIBWC has no ownership or direct control of extent or timing of water releases.
- Watershed management for sediment control in support of NRCS and/or regional initiatives.
- Agreements for maintenance of existing dams (Alamo, Camp Rice, Diablo, and Macho Arroyos) and/or development of new dams (Guayuco Arroyo) and sediment traps (Alamo and Diablo Arroyos) for upstream sediment control.

Two multi-purpose uses of the Rectification Project were excluded from evaluation in the PEIS: reconnection of historic, low-elevation meanders eliminated by the project rectification, now located in private lands; and levee setbacks at flood-prone areas for wildlife habitat expansion, a measure not anticipated or considered feasible for USIBWC implementation.

Table 4.3 Actions Associated with Multipurpose Management of the Rectification Project

RECTIFICATION PROJECT	ALTERNATIVE*			Anticipated Change Relative to the No Action Alternative
	EOM	IWR	MPM	
FLOOD CONTROL AND WATER DELIVERY				
Levee improvements and changes in floodway and channel maintenance	X	X	X	MPM Alternative includes all measures identified as feasible for the EOM Alternative
FLOODWAY AND WATER RESOURCES MANAGEMENT				
Improvements in water quality, use and conservation		X	X	MPM Alternative includes all measures identified as feasible for the IWR Alternative
MULTIPURPOSE PROJECT MANAGEMENT				
Jurisdictional Floodway Use				
Non-USIBWC floodway maintenance				No changes. Third-party floodway maintenance is not under consideration nor anticipated
Parks, nature trails, recreational areas				New initiatives beyond ongoing cooperation with the City of El paso are unlikely given the increased access restriction to the floodway
Control of invasive/exotic species			X	Implementation possible as part of a regional plan for salt cedar removal
Wildlife habitat conservation				No changes are anticipated; existing habitat to be retained as part of the No Action Alternative;
Establish/improve riparian corridors				Not viable at a significant extent given flood control requirements and USBP operations
Cooperative Agreements and Regional Initiatives				
Control of invasive/exotic species outside ROW			X	Potential participation in salt cedar removal initiatives identified as a regional priority
Wildlife habitat conservation outside ROW			X	Potential participation as a mitigation action or under a multi-agency habitat conservation initiative
Increase backwaters at mouth of arroyos to increase aquatic habitat				Not viable at a significant extent given minimum water availability
Reconnection of historic, low-elevation meanders to create aquatic habitat				Unlikely implementation due to likely boundary destabilization, losses in water delivery efficiency
Levee setbacks at floodprone areas for increased habitat				Implementation is not anticipated or considered feasible for USIBWC implementation
Flow regime modification to provide year-round baseflow			X	Potential participation in a viable regional, multiagency initiative
Watershed management for sediment control				Not significant given the minimum floodway contribution to watershed sediment load.
Upstream sediment control (dams, traps)			X	Potential participation under interagency agreements (new structures or maintenance of existing structures)
*EOM: Enhanced O&M; IWR: Integrated Water Resources Management; MPM: Multipurpose Project Management				

SECTION 4

PRESIDIO-OJINAGA FLOOD CONTROL PROJECT

4.1 DESCRIPTION

The Presidio Project was implemented in 1975 to protect productive agricultural lands in the Presidio-Ojinaga Valley from frequent flooding. The project was also intended to establish the international boundary as per the Boundary Treaty of 1970. Figures 4.1 and 4.2 show the location of the project and key geographic features.

4.1.1 Components

The Presidio Project provided flood protection by augmenting the capacity of the river channel through the construction of cleared berms and levees on both sides of the river. The project extends for 13.1 miles through Presidio, Texas. Rectification also took place at the time of project construction, reducing the channel length by about 6.3 miles. Levees on the north and south sides of Cibolo Creek are each 145 feet wide, from the land side ROW limit to the creek side ROW limit. The levees were designed to contain a 25-year flood with 4 feet of freeboard. Downstream of the confluence with the Rio Conchos, the design flow is 42,000 cfs. The levees downstream of the end of the river relocation were raised 4 feet following the September 1978 flood.

There are approximately 15 miles of levee length, including the spur levees. The height of the levees varies from 12 to 35 feet, with the higher at the southern end of the project. The crest width was originally designed to be 16 feet, but is currently between 8 and 12 feet, with the narrower crests at the southern end of the project.

4.1.2 Water Resources

The Presidio Project is located within water quality management Segments 2306 and 2307 of the Rio Grande, as defined by the Texas Commission on Environmental Quality. Segment 2307 extends from the Riverside Diversion Dam in El Paso County to the confluence of the Rio Conchos in Presidio County, while Segment 2306 extends from the confluence of the Rio Conchos to the International Amistad Reservoir. The designated uses of the two segments are high aquatic life, contact recreation, fish consumption, and public water supply. Water quality information below the confluence of the Rio Conchos but upstream of Presidio shows that chloride, sulfate, fecal coliform, and total dissolved solids exceed surface water quality and drinking water supply standards. Furthermore, monitoring information shows that fecal coliform concentrations increase as the river flows through the Presidio-Ojinaga urban area.

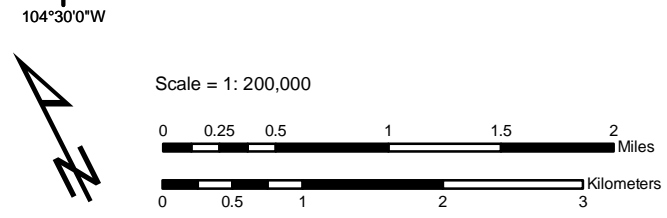
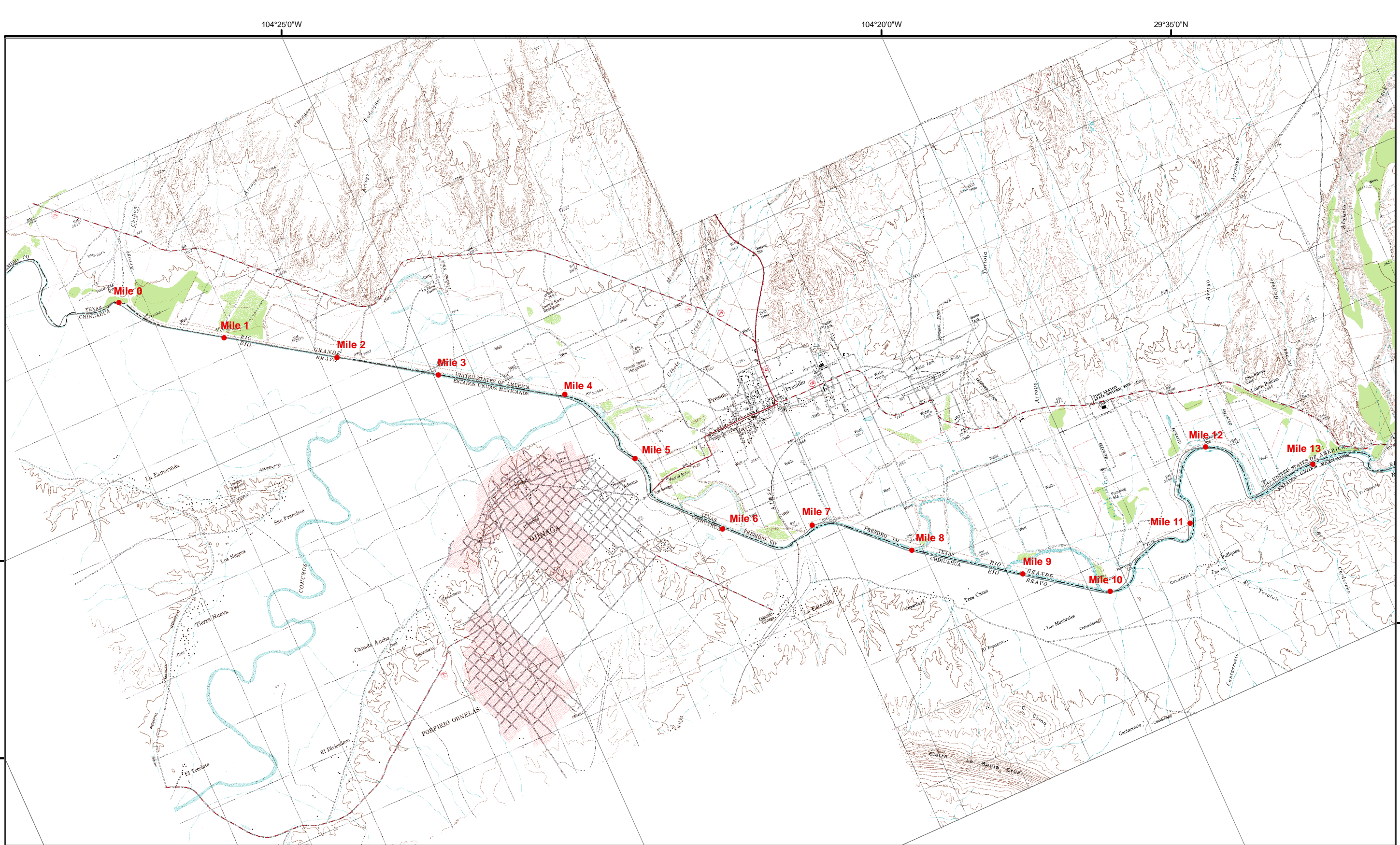
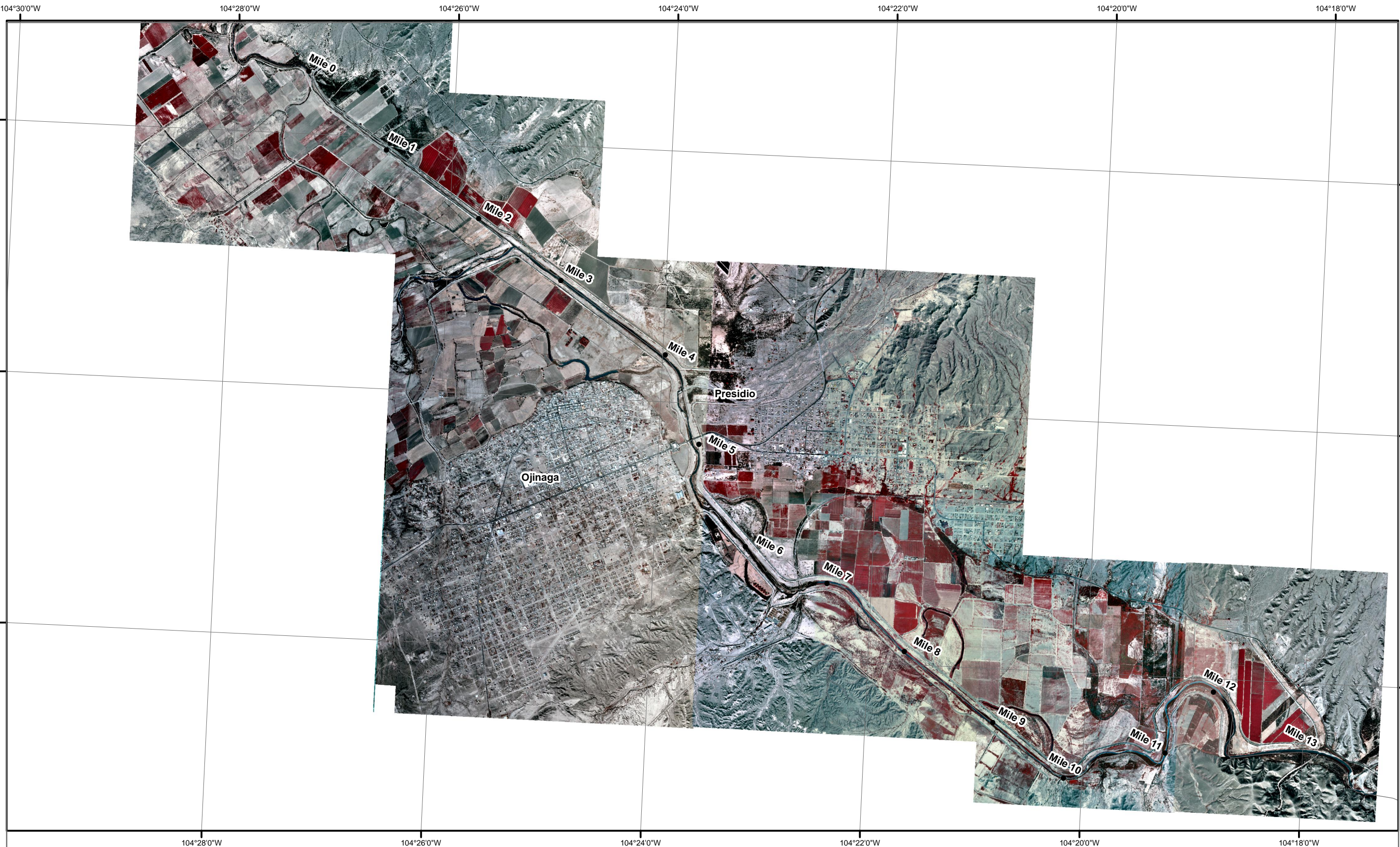


Figure 4.1
Presidio - Ojinaga Flood Control Project
Programmatic EIS
International Boundary and Water Commission,
United States Section



Scale = 1: 200,000

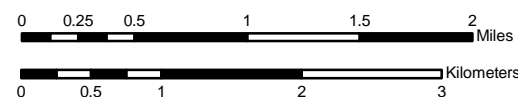


Figure 4.2
Presidio - Ojinaga Flood Control Project, Aerial Photography

Programmatic EIS
International Boundary and Water Commission,
United States Section

4.2 CURRENT MAINTENANCE PRACTICES

4.2.1 Levee System

The USIBWC conducts the following activities for maintenance of floodways of the Presidio Project, either routinely or on an as-needed basis:

- Grade and resurface maintenance road on levees (annually)
- Mow grass, cut brush/woody vegetation from levee slopes (primarily landside); hand cut vegetation where slopes are too steep (primarily riverside); repair erosion-related damage
- Reinforce levees with rock where needed

Side slopes are mowed continually, and mesquite and salt cedars are removed from the levees. Grading of the levee crest and approach ramps is done as needed. A flex base material is applied to the levee crest and ramps as needed to eliminate rutting. Mowers are used for mowing, a backhoe and dozer are used for grubbing, and a water truck compactor and grader are used for crest grading.

4.2.2 Floodways

The USIBWC conducts the following activities for maintenance of the Presidio Project levee system, either routinely or on an as-needed basis:

- Mow 400 acres of floodway to control weeds and woody vegetation up to twice per growing season
- Maintain no-mow zone/wildlife travel corridor which helps protect levee system
- Remove debris in floodway on regular basis

Minute 247 requires that the area between the boundary line and the levees is to be maintained clear and free of vegetation. For this purpose USIBWC controls vegetation in the levees and floodways, mows 400 acres semi-annually, and removes mesquite and salt cedar. Mowing and grubbing is done year round.

A 25-foot wide, 1-mile long strip of land between the confluence of the Rio Conchos and Cibolo Creek is not mowed or cleared. This strip is located in the floodway, starting about 16 feet from the toe of the levee. The strip has not been mowed since the levee was constructed.

The USBP drags tires both in the floodplain and on the land side of the U.S. levee to track illegal entry. Dragging is done at the toe of the levee. This dragging sometimes appears to cause erosion in the floodplain.

4.2.3 River Channel

The USIBWC conducts the following activities for maintenance of the Presidio Project river channel, either routinely or on an as-needed basis:

- Remove sediment from channel and drains to maintain conveyance capacity and diversion requirements
- Stabilize banks as needed using rocks
- Excavate creek mouths (including Cibolo Creek and Alamito Creek) to maintain channel grade and conveyance

Scrapers and bulldozers are used, as needed, to remove debris and move silt from the river channel to eroded banks. Sediment is disposed on floodways, uplands, and on federal and private land, in accordance with existing agreements. Silt is also removed from the mouth of Cibolo Creek to the extent allowed by the USIBWC jurisdiction only.

4.3 ENHANCED O&M (EOM)

Possible or likely actions for enhanced O&M of the Presidio Project in terms of flood control improvements and changes in water delivery are discussed below and summarized in Table 5.1.

Improvements to the levee system will entail an increase in height as indicated by hydraulic modeling results to meet current flood control criteria. Limited structural improvements are also anticipated. Levee relocation along the Presidio Project is not anticipated nor considered a desirable/viable option for implementation by the USIBWC.

Table 5.1 Potential Improvements to Flood Control and Water Delivery in the Presidio Project

PRESIDIO PROJECT	ALTERNATIVE*			Anticipated Change Relative to the No Action Alternative
	EOM	IWR	MPM	
FLOOD CONTROL AND WATER DELIVERY				
Levee Improvements				
Levee height increase	X	X	X	Improvement projects required as indicated by hydraulic modeling
Structural levee improvements	X	X	X	Improvement projects partially required to implement USACE 2004 recommendations
Relocation within ROW or new flood easements				Changes are not anticipated or a considered a desirable/viable option for implementation
Changes in Floodway Management				
Streambank stabilization with vegetation in combination with mechanical means				Implementation is not anticipated on a large scale
Vegetation removal modification in terms of timing/extent of mowing				
Agricultural/grazing use				Use of agricultural/grazing leases for floodway management has been discontinued
Changes in Channel Maintenance				
Sediment removal and disposal	X	X	X	Changes possible in extent or disposal location (outside floodway under commercial agreements)
Debris removal				No changes anticipated; to be continued on an as-needed basis
Shore/aquatic vegetation removal				No changes relative to current implementation on-as-needed basis
New/changes to diversion structures				None planned. Future changes will not be USIBWC initiatives
*EOM: Enhanced O&M; IWR: Integrated Water Resources Management; MPM: Multipurpose Project Management				

Changes in *floodway management* are possible for localized projects of streambank stabilization by combined use of mechanical measures and shore vegetation. Currently a 1-mile segment 25-feet wide is maintained from Rio Concho to Cibolo Creek. Greater restrictions on public use/access to the floodway are expected as a result of increased USBP operations (restricted use zones). No changes in timing/extent of mowing and wooded vegetation control other than coordination with other agencies (USBP, USFWS, USACE) are anticipated. Leases for agricultural use are not anticipated and the policy of eliminating grazing leases will be continued.

Changes in *river channel maintenance* would cover primarily sediment disposal outside the floodway through commercial agreements. No changes are expected in the timing or extent of activities for removal of sediment, debris, and shore/aquatic vegetation, currently conducted on an as-needed basis. Changes to water diversion dams or structures, or new construction, are not planned as USIBWC initiatives.

4.4 INTEGRATED WATER RESOURCES MANAGEMENT (IWR)

In addition to those previously discussed for the EOM Alternative, possible or likely future actions for improvements to water resources management are discussed below and summarized in Table 5.2.

The main improvements for *water use and conservation* are development and implementation of control plans for extensive salt cedar formations along the channel and at arroyo mouths. No significant projects, or a potential for implementation, have been identified for revegetation with low-water use species; wetlands improvement; and support of irrigation BMPs to increase water delivery efficiency.

Water quality improvements are primarily limited to continued monitoring as part of the Texas Clean River Program and other water quality programs, as Rio Concho water quality largely determines conditions along the Presidio Project. Given the short and narrow floodway of the Presidio Project, minimum benefits are anticipated for additional floodway revegetation to control erosion or use of treatment methods for irrigation return flows.

Table 5.2 Potential Improvements to Water Resources Management in the Presidio Project

PRESIDIO PROJECT	ALTERNATIVE*			Anticipated Change Relative to the No Action Alternative
	EOM	IWR	MPM	
FLOOD CONTROL AND WATER DELIVERY				
Levee improvements and changes in floodway and channel maintenance	X	X	X	IWR Alternative includes all meaures identified as feasible for the EOM Alternative
INTEGRATED WATER RESOURCES MANAGEMENT				
Water Use and Conservation				
Salt cedar management		X	X	Changes possible to develop and implement salt cedar management along the channel and arroyos
Revegetation with low-water use species				Implementartion is not anticipated at a significant extent given the small floodway acreage
Wetlands improvement				Implementation is not under consideration or considered viable to a significant extent
Irrigation BMPs to increase water delivery efficiency				Return flows are not large enough to justify implementation of this measure
Water Quality				
Water quality monitoring				No changes anticipated to ongoing participation in state monitoring programs.
Support maintenance of irrigation structures and drains				No changes anticipated to ongoing cooperation with irrigation districts
Limited floodway revegetation for erosion control				Implementation is not expected given the small extent of the floodway
*EOM: Enhanced O&M; IWR: Integrated Water Resources Management; MPM: Multipurpose Project Management				

4.5 MULTIPURPOSE PROJECT MANAGEMENT (MPM)

In addition to those previously discussed for the IWR Alternative, possible or likely future actions for multipurpose use of the Presidio Project are discussed below. The multipurpose use of the jurisdictional floodway and cooperative agreements/environmental initiatives are summarized in Table 5.3.

Table 5.3 Actions Associated with Multipurpose Management of the Presidio Project

PRESIDIO PROJECT	ALTERNATIVE*			Anticipated Change Relative to the No Action Alternative
	EOM	IWR	MPM	
FLOOD CONTROL AND WATER DELIVERY				
Levee improvements and changes in floodway and channel maintenance	X	X	X	MPM Alternative includes all measures identified as feasible for the EOM Alternative
FLOODWAY AND WATER RESOURCES MANAGEMENT				
Improvements in water quality, use and conservation		X	X	MPM Alternative includes all measures identified as feasible for the IWR Alternative
MULTIPURPOSE PROJECT MANAGEMENT				
Jurisdictional Floodway Use				
Non-USIBWC floodway maintenance				Continued coordination with USBP to ensure levee integrity
Parks, nature trails, recreational areas				Not viable given the extent of floodway and access restrictions
Control of invasive/exotic species			X	Implementation possible as part of a regional plan for salt cedar removal
Wildlife habitat conservation				Existing habitat to be retained as part of the No Action Alternative;
Establish/improve riparian corridors				Not viable at a significant extent given requirements for flood control, USBP operations
Cooperative Agreements and Regional Initiatives				
Control of invasive/exotic species outside ROW			X	Potential participation in salt cedar removal initiatives identified as a regional priority
Wildlife habitat conservation outside ROW				No initiatives have been proposed; implementation by the USIBWC is not considered viable
Increase backwaters at mouth of arroyos to increase aquatic habitat				Non-viable at a significant extent given low flow and intermittent nature of arroyos
Reconnection of historic, low-elevation meanders to create aquatic habitat				Unlikely implementation due to likely boundary destabilization, loss in water delivery efficiency
Levee setbacks at floodprone areas for increased habitat				Use of setbacks is not anticipated or considered feasible for USIBWC implementation
Flow regime modification to provide year-round baseflow			X	Potential participation in a viable regional, multiagency initiative
Watershed management for sediment control				Not significant given the minimum floodway contribution to watershed sediment load
*EOM: Enhanced O&M; IWR: Integrated Water Resources Management; MPM: Multipurpose Project Management				

The potential for *multipurpose use of the jurisdictional floodway* is very limited given the short and narrow floodway availability. Coordination with City of Presidio and/or agencies would be possible for recreational use (trails, seasonal hunting), and salt cedar removal programs, but specific plans are not currently in place. Significant wildlife habitat development in the floodway is not anticipated. Third-party floodway maintenance is not under consideration.

Cooperative Agreements and Environmental Initiatives would extend beyond the USIBWC jurisdiction. Two initiatives, that would be implemented and managed by other agencies or organizations and supported by the USIBWC under cooperative agreements, are:

- Participation in salt cedar removal initiatives identified as a regional priority. This action to be conducted in coordination with the Mexican Government as previously implemented by the U.S. Forest Service at Big Bend National Park.
- Agreements for upstream sediment control at Alamito Creek in support of NRCS/regional initiatives.

Two multipurpose uses of the Presidio Project are not anticipated, nor considered feasible, for implementation by USIBWC: levee setbacks at flood-prone areas for wildlife habitat expansion, and reconnection of historic, low-elevation meanders.

SECTION 5

LOWER RIO GRANDE FLOOD CONTROL PROJECT

5.1 DESCRIPTION

The Lower Rio Grande Flood Control Project (LRGFCP) extends approximately 180 miles from Peñitas, Texas to the mouth of the river in the Gulf of Mexico. The project was the result of a 1932 agreement between the United States and Mexico to provide flood protection to urban, suburban, and agricultural lands in both countries.

5.1.1 Components

The LRGFCP consists of the river channel, flood levees in each country, two diversion dams, and off-river floodways in Mexico and the United States. Other components of the project include irrigation weirs, pump intakes, highway and railroad bridges, river gages, and levees. Some river straightening took place between 1976 and 1977 on a 9,000-foot length of river upstream of Hidalgo and Reynosa. The depth of the river channel varies from 1 to 15 feet.

Two diversion dams, Anzalduas and Retamal, were constructed to route most of the flood flows in the off-river floodway systems of the United States and Mexico, respectively. Anzalduas dam also diverts irrigation flows into Mexico. The interior floodway system in the United States has a total area of 27,013 acres between the levees in Hidalgo, Cameron, and Willacy Counties.

The United States portion of the project includes 182 miles of levees along the Rio Grande, and 120 miles in an off-stream, interior floodway system. This off-stream system consists of a Main Floodway that separates into the North Floodway and the Arroyo Colorado Floodway at the City of Mercedes. The levee system has an average levee height of approximately 15 feet, an average base width of 90 to 120 feet, and an average crown width of 14 to 16 feet. Levee separation is between 600 feet to 1 mile. Figure 5.1 shows the overall project location; and Figures 5.2, 5.3 and 5.4 individual maps are provided for the upper river reach of the LRGFCP and the Main Floodway (Figure 5.2), the lower river reach of the LRGFCP (Figure 5.2), and the North and Colorado Floodways (Figure 5.4).

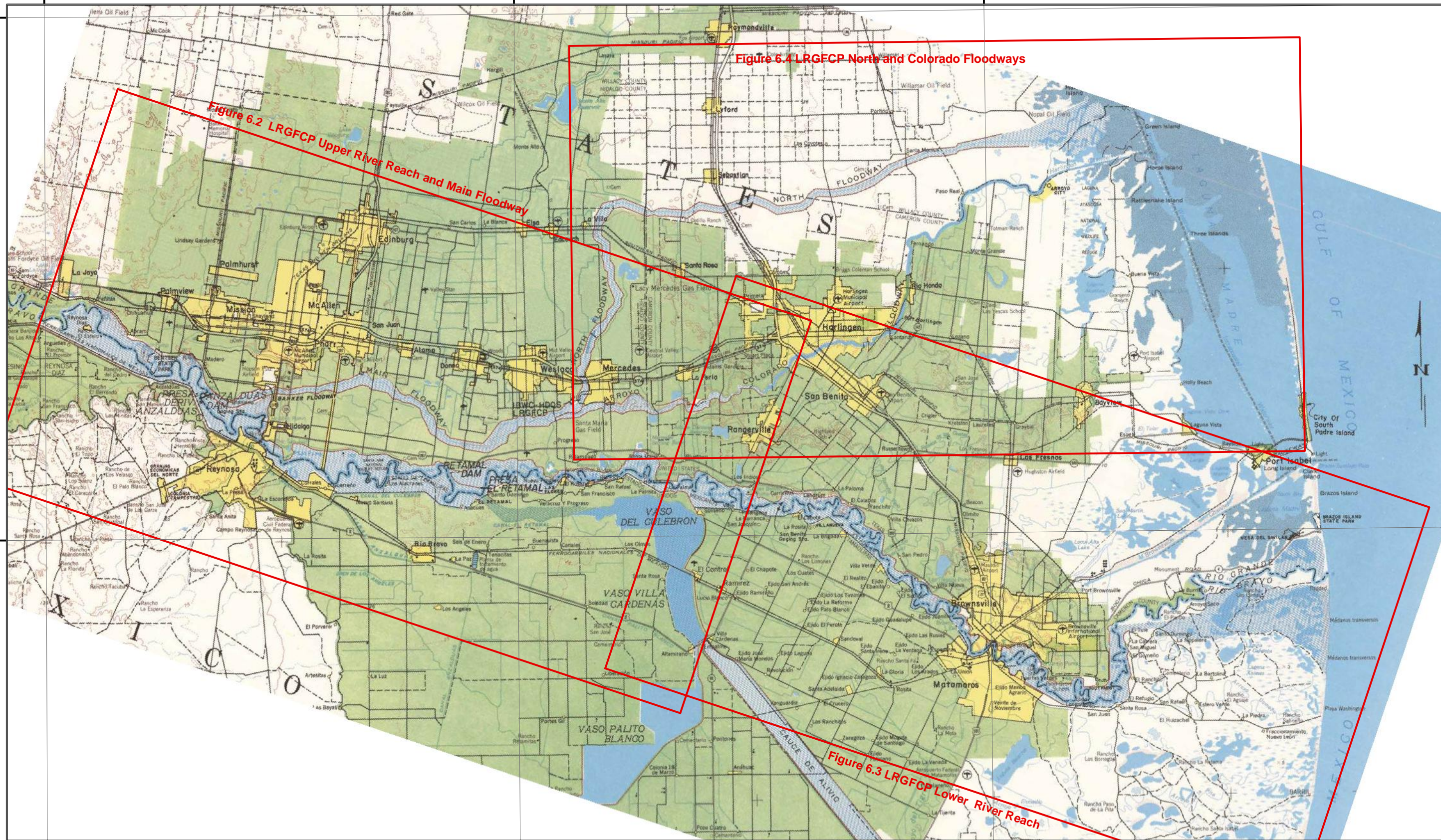
5.1.2 Water Resources

The project was designed and built for a flood of 250,000 cfs at Rio Grande City. During the design flood, 105,000 cfs would be diverted to the United States' off-river floodways at Anzalduas Dam, and 105,000 cfs would be diverted to Mexico's off-river floodway system at Retamal Dam. Diversion of flows at the two dams and water losses between Rio Grande City and the diversions would result in the passage of a maximum of 20,000 cfs through the Brownsville-Matamoros area.

98°30'0"W

98°0'0"W

97°30'0"W



98°30'0"W

98°0'0"W

97°30'0"W

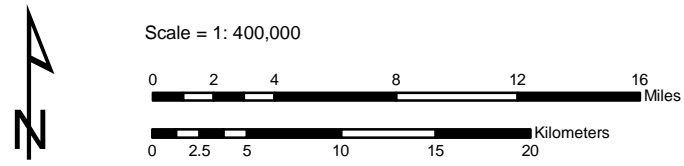
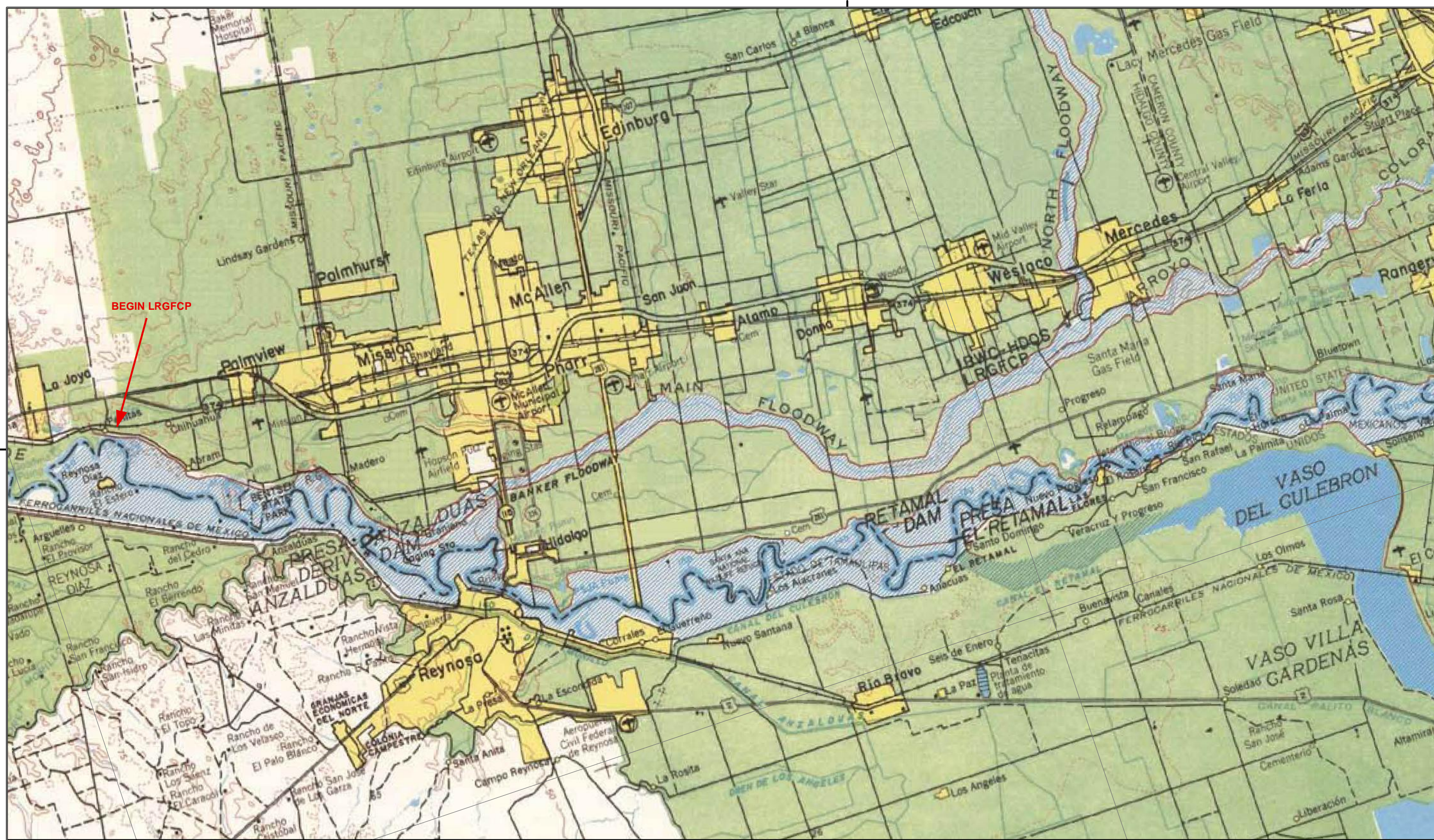


Figure 5.1
Lower Rio Grande Flood Control Project
Overview Map
Programmatic EIS
International Boundary and Water Commission,
United States Section

98°0'0"W



BEGIN LRGFCP

98°30'0"W

26°0'0"N

98°0'0"W

Scale = 1: 400,000

0 1 2 4 6 8 Miles

0 1.25 2.5 5 7.5 10 Kilometers

LEGEND



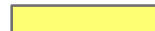
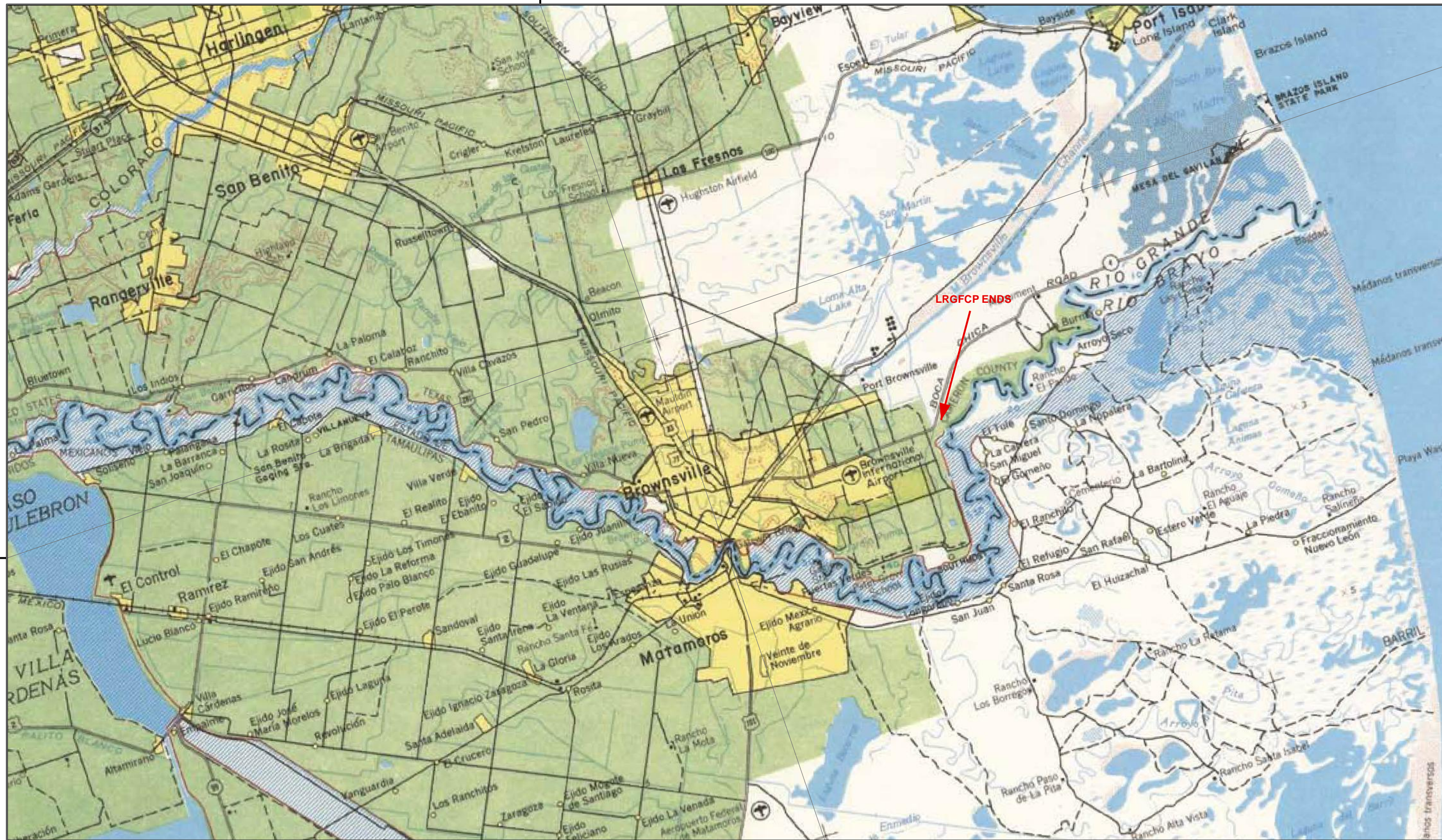
-  Irrigated Areas
-  Floodway
-  Urban Areas



Figure 5.2
LRGFCP Upper River Reach and Main Floodway

Programmatic EIS
International Boundary and Water Commission,
United States Section

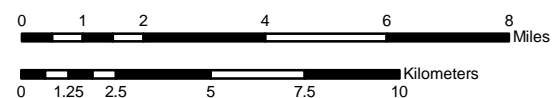
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97°30'0"W



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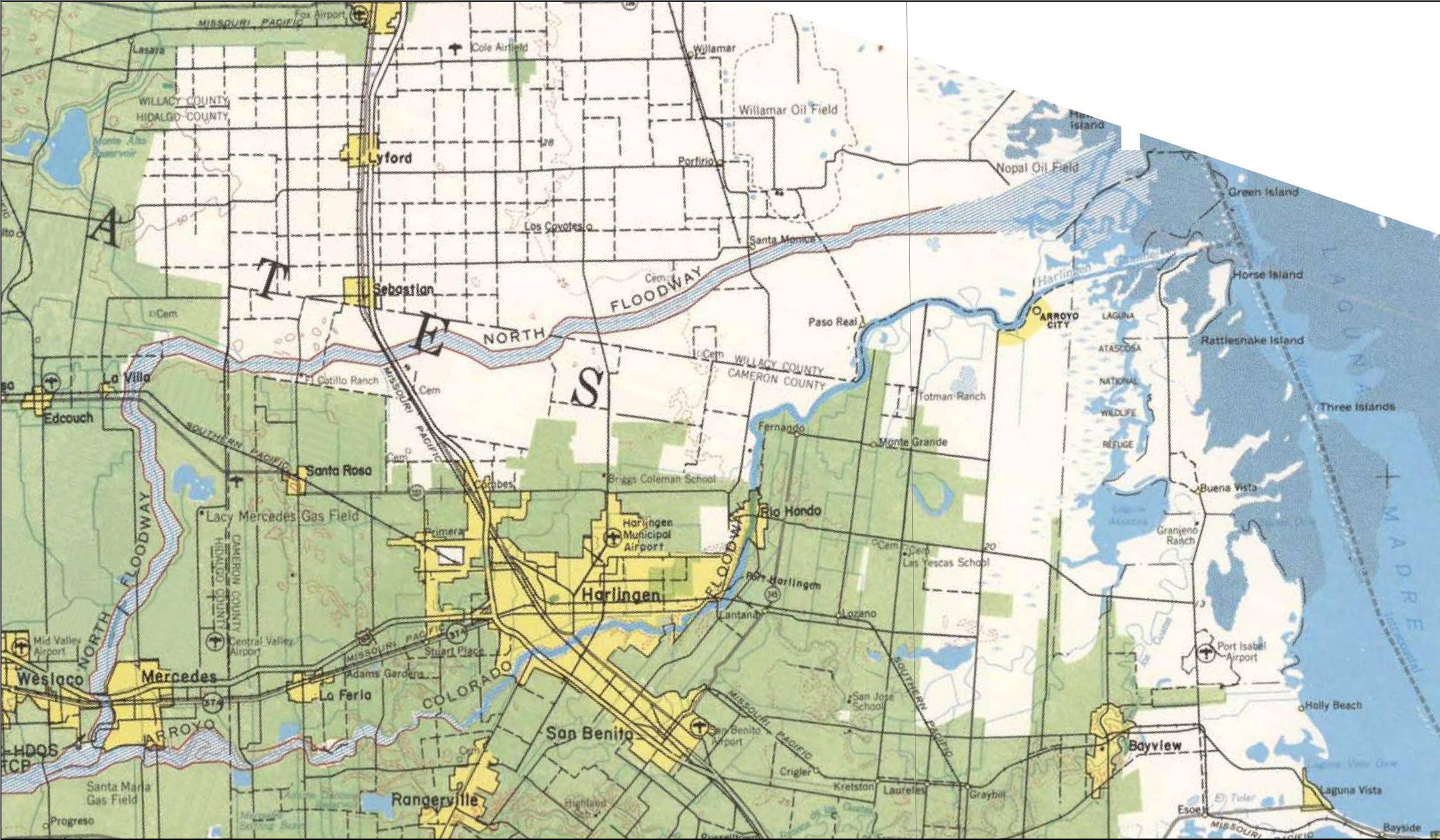
LEGEND



Figure 5.3
LRGFCP Lower River Reach

Programmatic EIS
International Boundary and Water Commission,
United States Section

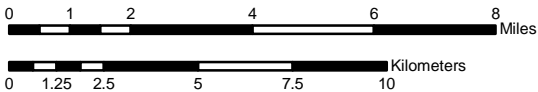
97°30'0"W



97°30'0"W



Scale = 1: 400,000



LEGEND

- Irrigated Areas
- Floodway
- Urban Areas



Figure 5.4
North and Arroyo Colorado Floodways
Programmatic EIS
International Boundary and Water Commission,
United States Section

The LRGFCP is located within water quality management Segments 2302 and 2301 of the Rio Grande, as defined by the Texas Commission on Environmental Quality. Segment 2302 extends from Falcon Reservoir in Starr County to a point 6.7 miles downstream of the International Bridge in Cameron County. Segment 2301 extends from the same point 6.7 miles downstream of the International Bridge to the confluence of the river with the Gulf of Mexico.

Segment 2302 is designated for high aquatic life use, contact recreation, general use, fish consumption, and public water supply. However, a portion of this segment is impaired for contact recreation due to high bacteria levels from the Pharr International Bridge to downstream of the Santa Ana NWR.

5.1.3 Environmental Improvements/Initiatives

Two golf courses are located in the interior floodway on land for which the USIBWC has a right-of-way. One located downstream of the inlet to the North Floodway, and one is downstream of FM 491 in the North Floodway. A third golf course is on USIBWC land on the Rio Grande at Fort Brown in the Brownsville area. The land is currently leased to the University of Texas at Brownsville for operation by the University. The USIBWC also owns most of the Anzalduas Park at the entrance to the interior floodway. The land is leased to Hidalgo County for operation. There is a hike and bike trail in the Arroyo Colorado floodplain in Harlingen, and a hike and bike trail in Hidalgo, which includes an ½ mile segment along the top of the levee, is under construction.

5.2 CURRENT MAINTENANCE PRACTICES

Prior to 1993, USIBWC maintenance practices in the LRGFCP included clearing of vegetation on the banks of the river channel and the floodway from the edge of the low water to the channel bank, or to a distance of 328 feet. Clearing of the bank was required for approximately 141 river miles, between river mile 28.0 and Anzalduas Dam. Although clearance of this segment was accomplished in 1967, USIBWC decided after 1970 to clear the playas within a 34.5-mile reach between river mile 28.0 and river mile 62.5, near Brownsville-Matamoros .

After 1993, vegetation control activities were reduced after issuance of a Biological Opinion by the U.S. Fish and Wildlife Service. The modified maintenance activities called for the clearing of vegetation from the edge of the low water to a distance of 75 feet, instead of the 328 feet previously mowed, between river mile 28.00 and river mile 62.50. In addition, a 33-foot wide vegetated wildlife corridor would be maintained to provide for habitat preservation for endangered species such as jaguarondi and ocelots. Mowing is conducted between June and August in agreement with A Biological Opinion issued by the USFWS.

5.2.1 Levee System

The USIBWC conducts the following activities for maintenance of the LRGFCP levee system, either routinely or on an as-needed basis:

- Blading of levees annually and repair erosion-related damage
- Reconditioning and maintaining roadway in the interior floodways; same practices as used on Rio Grande levees and ROWs

Levee maintenance activities include annual mowing, reconditioning levees with bulldozers, limited application of herbicides to levee slopes and roads, blading and rolling of roadways that have subgrade to maintain a 14 to 16-foot width, and surfacing levee roads with caliche. Mowing and reconditioning occur on all levees in the system. On the segment between river mile 28.0 and river mile 62.5, the levees are not treated with caliche or bladed and rolled because they are dirt, and the flood flow is less than 20,000 cfs.

5.2.2 Floodways

The USIBWC conducts the following activities for maintenance of the LRGFCP floodway, either routinely or on an as-needed basis:

- Mow 8,000 acres of floodway annually to control weeds and woody vegetation and remove debris; on high banks, hand clear vegetation every 5 years
- Mow grass to ground surface except where stipulated by the Biological Opinion (river miles 62.6 to mile 50.6 and 58.7 to 54.0)
- Clear stream bank of vegetation annually between river mile 28.0 to river mile 62.5.
- Interior Floodways – Mow, clean pilot channels and lateral drains of vegetation and silt.

The floodway is smoothed to ensure floodway capacity, keep irregularities from forming due to deposits, and facilitate mowing. USIBWC maintains 27,013 acres of floodway system. In the interior channels, much of the floodway area is dedicated to crops. Maintenance activities in the floodways not dedicated to crops, golf course, or other use include vegetation control such as mowing and brush clearing, sediment removal, floodway smoothing, and maintenance of the two diversion dams. The USIBWC mows about 8,000 acres of floodway area per year.

Vegetation control includes annual channel bank mowing in the Brownsville-Matamoros area between river mile 28.0 and river mile 62.5 in a 75-foot wide tract from the river's low water. In addition, steep banks are hand-cleared using chain saws every 5 years. Vegetation clearing along the high bank is limited to trimming the vertical vegetation by hand no more than every 5 years by cutting the branches overhanging the river that may capture flood debris.

Outside the 75-foot wide cleared tract in the area between river mile 28.00 and river mile 62.5, there is a 33-foot wide wildlife corridor that is not cleared in any way. Beyond the

wildlife corridor, there is a 150-foot wide cleared and mowed strip of land, serving as a buffer between the wildlife corridor and the toe of the levee.

Upstream of river mile 62.5, levee slopes are mowed to about 15 feet beyond the toe of the levee; there is only minimal vegetation clearing between the mowed area at the levee. Mowing in the Brownsville area begins in June of each year so the floodways will be in good condition during the flooding season. Mowing in other areas is done year-round.

Between river miles 55.2 to 45.0, the USIBWC has in place a Restricted Use Zone that limits construction activities that would cause flow deflections or obstructions

5.2.3 River Channel

The USIBWC conducts the following activities for maintenance of the LRGFCP river channel, either routinely or on an as-needed basis:

- Perform structural repairs and modifications to dams, bridges, river gages, as needed
- Perform annual structural repairs on spillway gates of Anzalduas Dam and Retamal Dam as well
- Remove sediment from the channel as needed, and at mouth of Rio Grande

Sediment is removed by excavation from the pilot channel and lateral drains year-round or as needed. Sediment removal is accomplished by hydraulic excavators, backhoes, bulldozers, and motor graders. Excavated material is spread along channel banks or disposed on floodways, uplands, federal and private land, in accordance with existing agreements

The lower reach of the LRGFCP suffers from periodic infestations of water hyacinth (floating) and hydrilla (on river bottom) that choke the channel, causing water delivery problems and loss of aquatic habitat. High flow episodes flush noxious vegetation downstream and out into the Gulf of Mexico. Partially funded by the USIBWC, the State of Texas removes hyacinth and hydrilla throughout the LRGFCP. Additional steps may be needed during low flow periods to control these infestations.

5.2.4 Other Practices

Multiple practices associated with environmental improvements and agency coordination apply to the LRGFCP:

- Follow vegetation maintenance requirements of 1993 and 2003 Biological Opinions, including mowing limited to the June-August period.
- Maintain 33-foot wildlife corridor on land side of 75-foot maintenance strip, mow 15-foot strip between wildlife corridor and levee from river mile 62.5 to river mile 28).

- Mow grass to ground surface except where vegetation must be $>$ or $+$ to 3 feet above ground surface as stipulated by Biological Opinion for the protection of threatened or endangered habitat (river mile 62.6 to river mile 50.6 and river mile 58.7 to river mile 54.0).
- Coordinate with Caminos del Rio Heritage project, a preservation effort by the National Parks Service and Mexico, and the Lower Rio Grande Valley NWR Acquisition Plan.

5.3 ENHANCED O&M (EOM)

Possible or likely actions for flood control improvements and changes in water delivery, summarized in Table 6.1, are discussed below. Improvements to the river channel do not apply to the interior floodways system.

Levee System. Improvements to the system are needed, particularly in the upper, 30-mile reach of the LRGFCP where required height increases are typically greater than 4 feet. Structural improvements, consistent with USACE 2004 recommendations, are also needed in multiple sections along the river levee system.

Floodway Maintenance. Changes in vegetation removal from the floodway, in terms of timing or extent of mowing, are possible in the upper reach of the LRGFCP (upstream of RM 62.5). In the lower reach, vegetation management is dictated by an existing USFWS Biological Opinion and, thus, not likely to undergo significant changes. An increase is expected on restrictions to public use of the floodway, as well as retention of existing Restricted Use Zones. Streambank stabilization by bioengineered techniques is not anticipated at a large scale.

River Channel. The need for sediment removal from the channel for boundary stabilization and reopening of mouth of Rio Grande will continue on an as-needed basis. Additional actions to eradicate aquatic invasive species from the LRGFCP lower reach could be implemented. No changes in debris removal practices are anticipated. There are no USIBWC plans for new water diversion structures or changes to existing ones.

Table 6.1 Potential Improvements to Flood Control and Water Delivery in the LRGFCP

LOWER RIO GRANDE FLOOD CONTROL PROJECT	ALTERNATIVE*			Anticipated Change Relative to the No Action Alternative
	EOM	IWR	MPM	
1. FLOOD CONTROL SYSTEM ALONG THE RIO GRANDE				
Levee Improvements				
Levee height increase	X	X	X	Improvement projects required based on hydraulic modeling. More significant height increase is required in the upper 30-mile reach
Structural levee improvements	X	X	X	Improvement projects required along multiple sections to implement USACE 2004 recommendations.
Relocation within ROW or new flood easements				Implementation is not considered desirable/viable option; USIBWC jurisdictional ROW is limited to a narrow levee corridor.
Changes in Floodway Management				
vegetation in combination with mechanical means				No significant changes. Small localized projects are possible but not anticipated at a large scale
Agricultural/grazing use				Use of agricultural/grazing leases for floodway management has been discontinued
Restricted Use Zones	X	X	X	Present at various locations and likely to increase as more restrictions on public use/access are expected
Changes in Channel Maintenance				
Sediment removal and disposal	X	X	X	Additional projects are possibly needed for boundary stabilization, improved stream flow
Debris removal				No changes anticipated; to be continued on a as-needed basis
Shore/aquatic vegetation removal	X	X	X	Increased participation in programs to eradicate aquatic invasive species from lower reach of LRGFCP
New/changes to diversion structures				Future construction of structures is not anticipated as an USIBWC initiative
2. INTERIOR FLOODWAY SYSTEM				
Levee Improvements				
Levee height increase	X	X	X	Improvement projects required for some segments of the Interior Floodways
Structural levee improvements				Changes not anticipated. No substantial deficiencies were identified in USACE 2003 study
Relocation within ROW or new flood easements				No changes. Use of additional flood easements is not anticipated
Changes in Floodway Management				
Streambank stabilization with vegetation in combination with mechanical means				Not applicable to the interior floodways
Vegetation management practices	X	X	X	Changes compatible with flood control are possible in extent of seasonal agriculture or management of
Agricultural/grazing use				No changes are anticipated to current use of seasonal agriculture lands as flood easements
Changes in Channel Maintenance				
Sediment and shore/aquatic vegetation removal; new diversion structures				Not applicable to the interior floodways
*EOM: Enhanced O&M; IWR: Integrated Water Resources Management; MPM: Multipurpose Project Management				

Operation and Maintenance of Interior Floodways. No substantial deficiencies have been identified for the interior levee system; in some locations, height increases smaller than 2 feet are required. Current uses of the interior floodways (seasonal agriculture and golf course use) are expected to continue in the future.

5.4 INTEGRATED WATER RESOURCES MANAGEMENT (IWR)

In addition to those measures included in the EOM Alternative, possible/likely actions for improvements to floodway use and water resources management are summarized in Table 6.2 and discussed below. Actions related to water resources management are not directly applicable to the interior floodway system.

Table 6.2 Potential Improvements to Water Resources Management for the River Reach of the LRGFCP

LOWER RIO GRANDE FLOOD CONTROL PROJECT	ALTERNATIVE*			Anticipated Change Relative to the No Action Alternative
	EOM	IWR	MPM	
FLOOD CONTROL AND WATER DELIVERY				
Levee improvements and changes in floodway and channel maintenance	X	X	X	IWR Alternative includes all measures identified as feasible for the EOM Alternative
INTEGRATED WATER RESOURCES MANAGEMENT				
Water Use and Conservation				
Salt cedar management				No significant management areas along the Rio Grande are under USIBWC jurisdiction
Revegetation with low-water use species				No significant management areas along the Rio Grande are under USIBWC jurisdiction
Wetlands improvement				Considered only as a mitigation action
Irrigation BMPs to increase water delivery efficiency		X	X	Possible in coordination with irrigation districts; measure is not likely to be an USIBWC initiative
Water Quality				
Water quality monitoring				No changes anticipated to ongoing participation in state monitoring programs
Modified irrigation drain maintenance		X	X	Possible cooperation plans with irrigation districts to improve return flow quality
Limited floodway revegetation for erosion control				Small jurisdictional floodway largely limits application beyond current management practices
*EOM: Enhanced O&M; IWR: Integrated Water Resources Management; MPM: Multipurpose Project Management				

Water Use and Conservation Practices. Implementation of irrigation best management practices to increase water delivery efficiency is possible; this measure is likely to be an initiative by irrigation districts supported by the USIBWC. Direct implementation of salt cedar control and revegetation with low-water use species in the very limited USIBWC jurisdictional floodway is not anticipated.

Improvements to Water Quality. The USIBWC will continue its cooperation with the Texas Clean River Program and other water quality programs. Modified irrigation drain maintenance to improve water quality is possible but not likely an USIBWC initiative.

5.5 MULTIPURPOSE PROJECT MANAGEMENT (MPM)

In addition to measures included in the IWR Alternative, possible or likely actions for multipurpose use of the jurisdictional floodway are summarized in Table 6.3. There is a minimum potential for additional use of the jurisdictional floodway since it is confined to narrow corridors along the levee system and stream banks. Most of the river floodway is privately owned or used for natural resources management.

Table 6.3 Actions Associated with Multipurpose Management for the River Reach of the LRGFCP

LOWER RIO GRANDE FLOOD CONTROL PROJECT	ALTERNATIVE*			Anticipated Change Relative to the No Action Alternative
	EOM	IWR	MPM	
FLOOD CONTROL AND WATER DELIVERY				
Levee improvements and changes in floodway and channel maintenance	X	X	X	MPM Alternative includes all measures identified as feasible for the EOM Alternative
FLOODWAY AND WATER RESOURCES MANAGEMENT				
Improvements in water quality, use and conservation		X	X	MPM Alternative includes all measures identified as feasible for the IWR Alternative
MULTIPURPOSE PROJECT MANAGEMENT				
Jurisdictional Floodway Use				
Non-USIBWC floodway maintenance, parks, invasive species control, riparian corridor				Minimum availability of USIBWC jurisdictional ROW; Nearly all of the river floodway is privately owned or used for management of natural resources
Cooperative Agreements and Regional Initiatives				
Vegetation removal and timing/extent of mowing			X	Changes in vegetation management are possible in the upper reach but limited in the lower reach by requirements of the USFWS Biological Opinion
Control of invasive/exotic species outside ROW			X	Increased USIBWC participation would be limited to regional initiatives such as the Aquatic Weed Taskforce
Wildlife habitat conservation inside or outside ROW			X	Possible participation in multi-agency regional habitat conservation initiatives
Increase backwaters at mouth of arroyos to increase aquatic habitat				This measure has not been identified as feasible
Reconnection of historic, low-elevation meanders to create aquatic habitat				Unlikely implementation given potential boundary destabilization and private land ownership of historic meanders
Levee setbacks at flood prone areas for increased habitat				Minimum availability of USIBWC jurisdictional ROW
Flow regime modification to provide year-round baseflow				Viable only as a regional, multiagency initiative as USIBWC has no ownership or direct control of extent/timing of water releases.
Watershed management for sediment control			X	Implementation possible as support to NRCS/regional initiatives
Upstream sediment control (dams, traps)				Not a key consideration as sediment is largely controlled upstream by Falcon and Amistad Dams
*EOM: Enhanced O&M; IWR: Integrated Water Resources Management; MPM: Multipurpose Project Management				

Cooperative agreements and environmental initiatives that could be implemented along the LRGFCP include:

- Control of invasive/exotic species outside the jurisdictional floodway and participation in regional initiatives such as the Aquatic Weed Taskforce
- Participation in regional multi-agency habitat conservation initiatives including aquatic habitat improvements (for example, increase of backwaters at mouth of arroyos)
- Because USIBWC has no ownership or direct control of extent/timing of water releases, a flow regime modification to maintain or increase year-round baseflow would be viable only as a regional, multiagency initiative
- Support of NRCS/regional initiatives for sediment control through watershed management

Due to conflicts with project mission or limited availability of jurisdictional floodway, habitat development by levee setbacks or reconnection of historic, low-elevation meanders is not considered a viable measure.

SECTION 6 TIJUANA RIVER PROJECT

6.1 DESCRIPTION

The Tijuana River Project is located in the United States portion of the Tijuana River and extends 2.3 miles from the international boundary. The project represents a continuation of the International Tijuana River Flood Control Project that begins in Mexico and provides flood protection to areas in both the United States and Mexico. The project, consisting of channel, floodways, and levees, was constructed for flood control in 1978. Figure 6.1 illustrates the Tijuana River Flood Control Project.

The channel consists of four sections: a 1,223-foot-long concrete lined channel, a 1,695-foot-long energy dissipater of grouted stone, an 824-foot long energy dissipater of dumped stone, and an 8,202-foot long unlined channel. The flared energy dissipater reduces velocities of the flows. The total modified channel length from the United States and Mexico border to the start of the natural Tijuana River channel in San Diego County, California is 2.3 miles. The capacity of the low-flow channel is approximately 2,000 cfs. The stream channel is normally dry as dry-weather flows are currently intercepted one-half mile upstream of the border for treatment. The Tijuana River Project was constructed to control flooding and has no capability to control water quality of runoff that originates almost entirely from Tijuana.

Levees are located between the United States and Mexico border and Dairy Mart Road. The total levee length, including north and south levees, is 3.4 miles. On the north side of the river the levee length is 10,444 feet, and on the south side of the river the levee length is 7,178 feet.

6.2 CURRENT MAINTENANCE PRACTICES

Levee System. The USBP resurfaces roadways on the entire north and south levee roadways, according to the terms of a Memorandum of Understanding with the USIBWC. Roadway resurfacing is typically done about every 3 months. A scraper is used to level the top of the road. Decomposed granite or small gravel is then placed on the surface.

Floodway and Channel. Several activities are routinely conducted for floodway maintenance within the Tijuana River Project. Most of these activities are conducted by the USBP at their expense under the cooperation agreement with the USIBWC. Those activities include:

- Mow floodway for enforcement purposes using mowers and/or discs three to five times per year
- Mow within 200 to 300 yards of the river on the north and south sides

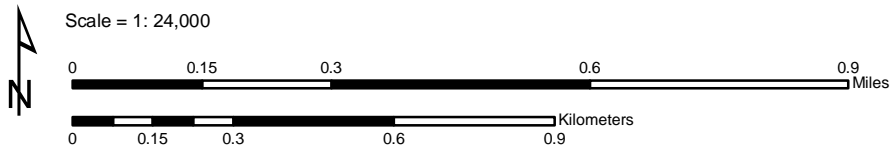


Figure 6.1
Tijuana River Flood Control Project
Programmatic EIS
International Boundary and Water Commission,
United States Section

- Dispose sediment on USIBWC property within floodway downstream of the energy dissipater
- Remove sediment and trash from all concrete-lined and grouted sections of the channel and at downstream end of project to prevent downstream flooding on an as-needed basis

Areas of floodway are leased for sod farm and recreational use by a model airplane club. Most of the land area in the north floodplain is sod farm, while most of the area in the south floodplain is sand. The model airplane club's land lease is about 20 acres located west of the South Bay International Wastewater Treatment Plant, south of the river channel, and downstream of the energy dissipater.

Since the USIBWC does not have a work crew at the San Diego field office, a crew from the American Dam field office removes sediment from the channel about once per year for about 2 weeks, normally during the spring or summer. A front end loader or bulldozer is usually used to clean the channel. Sediment is removed from all concrete-lined and grouted stone sections of the channel. The material is put into dump trucks and taken downstream of the energy dissipater to be spread in the floodplain on USIBWC property. This annual cleaning is not done when lack of rainfall results in little debris accumulation.

6.3 ENHANCED O&M (EOM)

Table 6.1 summarizes possible or likely actions for flood control improvement and multipurpose project use. Floodway maintenance is expected to continue under the existing agreement with the USBP; small-scale changes are possible in extent or timing of vegetation removal.

Additional best management practices are likely required because removal of trash and sediment from the channel has been identified as a concern in terms of potential downstream impacts. No changes are anticipated to current floodway uses; greater restrictions on public use/access of the floodway are expected due to increased requirements of USBP operations.

6.4 MULTIPURPOSE PROJECT MANAGEMENT (MPM)

Table 7.1 summarizes measures that, in addition to those included in the EOM Alternative, are possible actions for multipurpose use of the jurisdictional floodway. Increased USIBWC participation in regional wildlife habitat conservation initiatives is expected. The 2.3 mile project has a minimum potential for recreational activities and restricted public access due to USBP operations. Continued USIBWC participation is anticipated in regional initiatives such as the Tijuana River Valley Regional Park Trails and Enhancement Project. This project has been proposed by the San Diego County Department of Parks and Recreation on land adjacent to the flood control project. Improved control of sediment reaching the Tijuana River Project from adjacent canyons is expected. This activity is managed under a separate USIBWC project.

Table 6.1 Potential Actions Associated with Enhances O&M and Multipurpose Use of the Tijuana River Project

TIJUANA RIVER FLOOD CONTROL PROJECT	ALTERNATIVE*		Anticipated Change Relative to the No Action Alternative
	EOM	MPM	
FLOOD CONTROL AND WATER DELIVERY			
Levee height increase, structural improvements			No change; the need for height increase or structural improvements has not been identified
Levee relocation or new flood easements			No change in extent or location of current easements given land use restrictions
Vegetation removal and timing/extent of mowing	X	X	Changes are possible to improve water flow, sediment control
Best management practices (BMPs) for floodway maintenance and cleanup	X	X	Implementation of additional BMPs is possible to avoid debris and trash accumulation
Floodway land use			No changes are anticipated in current land use or leased-land utilization
Access restrictions			No change; current restrictions on public use/access are expected to continue
Sediment and debris removal	X	X	Changes in location, extent or timing are possible to improve project functionality
MULTIPURPOSE PROJECT MANAGEMENT			
Non-USIBWC floodway maintenance			No change; maintenance agreements with the U.S. Border Patrol are expected to continue
Addition of parks, nature trails, recreational areas			No change; the small floodway has restricted public access and a minimum potential for recreational activities
Wildlife habitat conservation		X	Potential participation in multi-agency, regional habitat conservation initiatives
Sediment control in tributary arroyos and canyons		X	Modification of sediment control upstream of the project or potential support of local initiatives
Upstream control of water quality			No change; the project has no capability to modify/control water quality of runoff originating in Tijuana.
*EOM: Enhanced O&M; MPM: Multipurpose Project Management			